Netflix Case Study -

1. Importing Libraries and Basic Observations

In [1]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

In [2]:
```
data = pd.read_csv("Netflix.csv")
```

In [3]:
```
data
```

Out[3]:

	show_id	type	title	director	cast	country	date_added	release_year	rating	d
0	s1	Movie	Dick Johnson Is Dead	Kirsten Johnson	NaN	United States	September 25, 2021	2020	PG-13	
1	s2	TV Show	Blood & Water	NaN	Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban...	South Africa	September 24, 2021	2021	TV-MA	S
2	s3	TV Show	Ganglands	Julien Leclercq	Sami Bouajila, Tracy Gotoas, Samuel Jouy, Nabi...	NaN	September 24, 2021	2021	TV-MA	1
3	s4	TV Show	Jailbirds New Orleans	NaN	NaN	NaN	September 24, 2021	2021	TV-MA	1
4	s5	TV Show	Kota Factory	NaN	Mayur More, Jitendra Kumar, Ranjan Raj, Alam K...	India	September 24, 2021	2021	TV-MA	S
...	...	...	...	...	...	...	...	...	...	
8802	s8803	Movie	Zodiac	David Fincher	Mark Ruffalo, Jake Gyllenhaal, Robert Downey J...	United States	November 20, 2019	2007	R	1
8803	s8804	TV Show	Zombie Dumb	NaN	NaN	NaN	July 1, 2019	2018	TV-Y7	S
8804	s8805	Movie	Zombieland	Ruben Fleischer	Jesse Eisenberg, Woody Harrelson, Emma Stone, ...	United States	November 1, 2019	2009	R	

	show_id	type	title	director	cast	country	date_added	release_year	rating	d
8805	s8806	Movie	Zoom	Peter Hewitt	Tim Allen, Courteney Cox, Chevy Chase, Kate Ma...	United States	January 11, 2020	2006	PG	
8806	s8807	Movie	Zubaan	Mozez Singh	Vicky Kaushal, Sarah-Jane Dias, Raaghav Chanan...	India	March 2, 2019	2015	TV-14	

In [4]:
```
data.shape
```

Out[4]:
```
(8807, 12)
```

In [5]:
```
# Data type -

data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 8807 entries, 0 to 8806
Data columns (total 12 columns):
 #   Column        Non-Null Count  Dtype 
---  ------        --------------  ----- 
 0   show_id       8807 non-null   object
 1   type          8807 non-null   object
 2   title         8807 non-null   object
 3   director      6173 non-null   object
 4   cast          7982 non-null   object
 5   country       7976 non-null   object
 6   date_added    8797 non-null   object
 7   release_year  8807 non-null   int64 
 8   rating        8803 non-null   object
 9   duration      8804 non-null   object
 10  listed_in     8807 non-null   object
 11  description   8807 non-null   object
dtypes: int64(1), object(11)
memory usage: 825.8+ KB
```

The size of the given dataset is Rows = 8807 & Columns = 12

In [ ]:
```
```

In [6]:
```
data.nunique()
```

Out[6]:
```
show_id         8807
type               2
title           8807
director        4528
cast            7692
country          748
date_added      1767
release_year      74
rating            17
duration         220
listed_in        514
description     8775
dtype: int64
```

In the data it seen that show_id column and title column has unique values. Hence it can be concluded that - Total 8807 movies/TV shows data is available in the dataset.

In [7]:
```
data.describe()
```

Out[7]:

	release_year
count	8807.000000
mean	2014.180198
std	8.819312
min	1925.000000
25%	2013.000000
50%	2017.000000
75%	2019.000000
max	2021.000000

It seems that only single column has numerical values, and it shows release year of the content ranges between what timeframe. It means rest all the columns are having the categorical data.

In [ ]:
```

```

2. Data Cleaning

Overall null values in each column of dataset

In [8]:
```
data.isna().sum()
```

Out[8]:
```
show_id          0
type             0
title            0
director      2634
cast           825
country        831
date_added      10
release_year     0
rating           4
duration         3
listed_in        0
description      0
dtype: int64
```

In [9]:
```
data.isna().sum().sum()
```

Out[9]:
```
4307
```

In [10]:
```
data[data["duration"].isna()]
```

Out[10]:

	show_id	type	title	director	cast	country	date_added	release_year	rating	duration
5541	s5542	Movie	Louis C.K. 2017	Louis C.K.	Louis C.K.	United States	April 4, 2017	2017	74 min	NaN
5794	s5795	Movie	Louis C.K.: Hilarious	Louis C.K.	Louis C.K.	United States	September 16, 2016	2010	84 min	NaN
5813	s5814	Movie	Louis C.K.: Live at the Comedy Store	Louis C.K.	Louis C.K.	United States	August 15, 2016	2015	66 min	NaN

It seems that there are 3 missing values in duration column, that values entered in rating column by mistake.

In [11]:
```
# Replacing the wrong entries in rating column


a = data[data["duration"].isna()].index
a
```

Out[11]:
```
Int64Index([5541, 5794, 5813], dtype='int64')
```

In [12]:
```
data.loc[a] = data.loc[a].fillna(method = "ffill", axis = 1)
```

In [13]:
```
# Replacing wrong entries in rating column with "Not Available"

data.loc[a, "rating"] = "Not Available"
```

In [14]:
```
data.loc[a]
```

Out[14]:

	show_id	type	title	director	cast	country	date_added	release_year	rating	duratio
5541	s5542	Movie	Louis C.K. 2017	Louis C.K.	Louis C.K.	United States	April 4, 2017	2017	Not Available	74 mi
5794	s5795	Movie	Louis C.K.: Hilarious	Louis C.K.	Louis C.K.	United States	September 16, 2016	2010	Not Available	84 mi
5813	s5814	Movie	Louis C.K.: Live at the Comedy Store	Louis C.K.	Louis C.K.	United States	August 15, 2016	2015	Not Available	66 mi

In [15]:
```
# Null values in rating column fill with "Not Available"

data[data["rating"].isna()]
```

Out[15]:

	show_id	type	title	director	cast	country	date_added	release_year	rating
5989	s5990	Movie	13TH: A Conversation with Oprah Winfrey & Ava ...	NaN	Oprah Winfrey, Ava DuVernay	NaN	January 26, 2017	2017	NaN
6827	s6828	TV Show	Gargantia on the Verdurous Planet	NaN	Kaito Ishikawa, Hisako Kanemoto, Ai Kayano, Ka...	Japan	December 1, 2016	2013	NaN
7312	s7313	TV Show	Little Lunch	NaN	Flynn Curry, Olivia Deeble, Madison Lu, Oisín ...	Australia	February 1, 2018	2015	NaN
7537	s7538	Movie	My Honor Was Loyalty	Alessandro Pepe	Leone Frisa, Paolo Vaccarino, Francesco Miglio...	Italy	March 1, 2017	2015	NaN

In [16]:
```
b = data[data["rating"].isna()].index
b
```

Out[16]:
```
Int64Index([5989, 6827, 7312, 7537], dtype='int64')
```

In [17]:
```
data.loc[b, "rating"] = "Not Available"
```

In [18]:
```
data.loc[b]
```

Out[18]:

	show_id	type	title	director	cast	country	date_added	release_year	rati
5989	s5990	Movie	13TH: A Conversation with Oprah Winfrey & Ava ...	NaN	Oprah Winfrey, Ava DuVernay	NaN	January 26, 2017	2017	N Availab
6827	s6828	TV Show	Gargantia on the Verdurous Planet	NaN	Kaito Ishikawa, Hisako Kanemoto, Ai Kayano, Ka...	Japan	December 1, 2016	2013	N Availab
7312	s7313	TV Show	Little Lunch	NaN	Flynn Curry, Olivia Deeble, Madison Lu, Oisín ...	Australia	February 1, 2018	2015	N Availab
7537	s7538	Movie	My Honor Was Loyalty	Alessandro Pepe	Leone Frisa, Paolo Vaccarino, Francesco Miglio...	Italy	March 1, 2017	2015	N Availab

In [19]:
```
data.rating.unique()
```

Out[19]:
```
array(['PG-13', 'TV-MA', 'PG', 'TV-14', 'TV-PG', 'TV-Y', 'TV-Y7', 'R',
       'TV-G', 'G', 'NC-17', 'Not Available', 'NR', 'TV-Y7-FV', 'UR'],
      dtype=object)
```

In [ ]:
```

```

In [20]:
```
data[data["date_added"].isna()]
```

Out[20]:

	show_id	type	title	director	cast	country	date_added	release_year	rating	du
6066	s6067	TV Show	A Young Doctor's Notebook and Other Stories	NaN	Daniel Radcliffe, Jon Hamm, Adam Godley, Chris...	United Kingdom	NaN	2013	TV-MA	S
6174	s6175	TV Show	Anthony Bourdain: Parts Unknown	NaN	Anthony Bourdain	United States	NaN	2018	TV-PG	S
6795	s6796	TV Show	Frasier	NaN	Kelsey Grammer, Jane Leeves, David Hyde Pierce...	United States	NaN	2003	TV-PG	S
6806	s6807	TV Show	Friends	NaN	Jennifer Aniston, Courteney Cox, Lisa Kudrow, ...	United States	NaN	2003	TV-14	S
6901	s6902	TV Show	Gunslinger Girl	NaN	Yuuka Nanri, Kanako Mitsuhashi, Eri Sendai, Am...	Japan	NaN	2008	TV-14	S
7196	s7197	TV Show	Kikoriki	NaN	Igor Dmitriev	NaN	NaN	2010	TV-Y	S
7254	s7255	TV Show	La Familia P. Luche	NaN	Eugenio Derbez, Consuelo Duval, Luis Manuel Áv...	United States	NaN	2012	TV-14	S
7406	s7407	TV Show	Maron	NaN	Marc Maron, Judd Hirsch, Josh Brener, Nora Zeh...	United States	NaN	2016	TV-MA	S
7847	s7848	TV Show	Red vs. Blue	NaN	Burnie Burns, Jason Saldaña, Gustavo Sorola, G...	United States	NaN	2015	NR	S

	show_id	type	title	director	cast	country	date_added	release_year	rating	du
8182	s8183	TV Show	The Adventures of Figaro Pho	NaN	Luke Jurevicius, Craig Behenna, Charlotte Haml	Australia	NaN	2015	TV-Y7	S

In [21]:
```
data.drop(data.loc[data["date_added"].isna()].index, axis = 0, inplace = True)
data["date_added"].value_counts()
```

Out[21]:
```
January 1, 2020      109
November 1, 2019      89
March 1, 2018         75
December 31, 2019     74
October 1, 2018       71
                    ...
December 4, 2016       1
November 21, 2016      1
November 19, 2016      1
November 17, 2016      1
January 11, 2020       1
Name: date_added, Length: 1767, dtype: int64
```

In [22]:
```
# changing data type from object to datetime

data["date_added"] = pd.to_datetime(data["date_added"])
data["date_added"]
```

Out[22]:
```
0      2021-09-25
1      2021-09-24
2      2021-09-24
3      2021-09-24
4      2021-09-24
          ...
8802   2019-11-20
8803   2019-07-01
8804   2019-11-01
8805   2020-01-11
8806   2019-03-02
Name: date_added, Length: 8797, dtype: datetime64[ns]
```

Dropped the null values from date_added column, and converted data type of date_added column from "object" to "datetime"

In [ ]:
```
```

Adding the new columns "year_added" & "month_added" by extracting the year & month from 'date_added' column.

In [23]:
```
# Add year_added column

data["year_added"] = data["date_added"].dt.year

# Add month_added column

data["month_added"] = data["date_added"].dt.month
```

In [24]:
```
data.head()
```

Out[24]:

	show_id	type	title	director	cast	country	date_added	release_year	rating	duratio
0	s1	Movie	Dick Johnson Is Dead	Kirsten Johnson	NaN	United States	2021-09-25	2020	PG-13	90 mi
1	s2	TV Show	Blood & Water	NaN	Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban...	South Africa	2021-09-24	2021	TV-MA	Seasor
2	s3	TV Show	Ganglands	Julien Leclercq	Sami Bouajila, Tracy Gotoas, Samuel Jouy, Nabi...	NaN	2021-09-24	2021	TV-MA	1 Seaso
3	s4	TV Show	Jailbirds New Orleans	NaN	NaN	NaN	2021-09-24	2021	TV-MA	1 Seaso
4	s5	TV Show	Kota Factory	NaN	Mayur More, Jitendra Kumar, Ranjan Raj, Alam K...	India	2021-09-24	2021	TV-MA	Seasor

In [25]:
```
data[["date_added", "year_added", "month_added"]].info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 8797 entries, 0 to 8806
Data columns (total 3 columns):
 #   Column       Non-Null Count  Dtype         
---  ------       --------------  -----         
 0   date_added   8797 non-null   datetime64[ns]
 1   year_added   8797 non-null   int64         
 2   month_added  8797 non-null   int64         
dtypes: datetime64[ns](1), int64(2)
memory usage: 274.9 KB
```

In [26]:
```
data.isna().sum()
```

Out[26]:
```
show_id            0
type               0
title              0
director        2624
cast             825
country          830
date_added         0
release_year       0
rating             0
duration           0
listed_in          0
description        0
year_added         0
month_added        0
dtype: int64
```

3.Non-Graphical Analysis

Types of content in dataset.

In [27]:
```
data["type"].unique()
```

Out[27]:
```
array(['Movie', 'TV Show'], dtype=object)
```

In [28]:
```
movies = data.loc[data["type"] == "Movie"]
movies.duration.value_counts()
```

Out[28]:
```
90 min     152
94 min     146
97 min     146
93 min     146
91 min     144
          ...
208 min      1
5 min        1
16 min       1
186 min      1
191 min      1
Name: duration, Length: 205, dtype: int64
```

In [29]:
```
tv_shows = data.loc[data["type"] == "TV Show"]
tv_shows.duration.value_counts()
```

Out[29]:
```
1 Season      1793
2 Seasons      421
3 Seasons      198
4 Seasons       94
5 Seasons       64
6 Seasons       33
7 Seasons       23
8 Seasons       17
9 Seasons        9
10 Seasons       6
13 Seasons       2
15 Seasons       2
12 Seasons       2
17 Seasons       1
11 Seasons       1
Name: duration, dtype: int64
```

Movie and TV shows both have different format for duration, we can change duration for movies as minutes & TV shows as seasons

In [30]:
```
movies["duration"] = movies["duration"].str[:-3]
movies["duration"] = movies["duration"].astype("float")
```

```
C:\Users\Lenovo\AppData\Local\Temp\ipykernel_15536\1416502109.py:1: SettingWithCopyWa
rning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/us
er_guide/indexing.html#returning-a-view-versus-a-copy
  movies["duration"] = movies["duration"].str[:-3]
C:\Users\Lenovo\AppData\Local\Temp\ipykernel_15536\1416502109.py:2: SettingWithCopyWa
rning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/us
er_guide/indexing.html#returning-a-view-versus-a-copy
  movies["duration"] = movies["duration"].astype("float")
```

In [31]:
```
tv_shows["duration"] = tv_shows["duration"].str[:-7].apply(lambda x : x.strip())
tv_shows["duration"] = tv_shows["duration"].astype("float")
```

```
C:\Users\Lenovo\AppData\Local\Temp\ipykernel_15536\2682526153.py:1: SettingWithCopyWa
rning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/us
er_guide/indexing.html#returning-a-view-versus-a-copy
  tv_shows["duration"] = tv_shows["duration"].str[:-7].apply(lambda x : x.strip())
C:\Users\Lenovo\AppData\Local\Temp\ipykernel_15536\2682526153.py:2: SettingWithCopyWa
rning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/us
er_guide/indexing.html#returning-a-view-versus-a-copy
  tv_shows["duration"] = tv_shows["duration"].astype("float")
```

In [32]:
```
tv_shows.rename({'duration': 'duration_in_seasons'} ,axis = 1 , inplace = True)
movies.rename({'duration': 'duration_in_minutes'} ,axis = 1 , inplace = True)
```

```
C:\Users\Lenovo\AppData\Local\Temp\ipykernel_15536\3956871887.py:1: SettingWithCopyWa
rning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/us
er_guide/indexing.html#returning-a-view-versus-a-copy
  tv_shows.rename({'duration': 'duration_in_seasons'} ,axis = 1 , inplace = True)
C:\Users\Lenovo\AppData\Local\Temp\ipykernel_15536\3956871887.py:2: SettingWithCopyWa
rning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/us
er_guide/indexing.html#returning-a-view-versus-a-copy
  movies.rename({'duration': 'duration_in_minutes'} ,axis = 1 , inplace = True)
```

In [33]:
```
tv_shows.head()
```

Out[33]:

	show_id	type	title	director	cast	country	date_added	release_year	rating	duratio
1	s2	TV Show	Blood & Water	NaN	Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban...	South Africa	2021-09-24	2021	TV-MA	
2	s3	TV Show	Ganglands	Julien Leclercq	Sami Bouajila, Tracy Gotoas, Samuel Jouy, Nabi...	NaN	2021-09-24	2021	TV-MA	
3	s4	TV Show	Jailbirds New Orleans	NaN	NaN	NaN	2021-09-24	2021	TV-MA	
4	s5	TV Show	Kota Factory	NaN	Mayur More, Jitendra Kumar, Ranjan Raj, Alam K...	India	2021-09-24	2021	TV-MA	
5	s6	TV Show	Midnight Mass	Mike Flanagan	Kate Siegel, Zach Gilford, Hamish Linklater, H...	NaN	2021-09-24	2021	TV-MA	

In [34]:
```
movies.head()
```

Out[34]:

	show_id	type	title	director	cast	country	date_added	release_year	rating
0	s1	Movie	Dick Johnson Is Dead	Kirsten Johnson	NaN	United States	2021-09-25	2020	PG-13
6	s7	Movie	My Little Pony: A New Generation	Robert Cullen, José Luis Ucha	Vanessa Hudgens, Kimiko Glenn, James Marsden, ...	NaN	2021-09-24	2021	PG
7	s8	Movie	Sankofa	Haile Gerima	Kofi Ghanaba, Oyafunmike Ogunlano, Alexandra D...	United States, Ghana, Burkina Faso, United Kin...	2021-09-24	1993	TV-MA
9	s10	Movie	The Starling	Theodore Melfi	Melissa McCarthy, Chris O'Dowd, Kevin Kline, T...	United States	2021-09-24	2021	PG-13
12	s13	Movie	Je Suis Karl	Christian Schwochow	Luna Wedler, Jannis Niewöhner, Milan Peschel, ...	Germany, Czech Republic	2021-09-23	2021	TV-MA

In [35]:
```
movies.duration_in_minutes
```

Out[35]:
```
0        90.0
6        91.0
7       125.0
9       104.0
12      127.0
        ...
8801     96.0
8802    158.0
8804     88.0
8805     88.0
8806    111.0
Name: duration_in_minutes, Length: 6131, dtype: float64
```

In [36]:
```
tv_shows.duration_in_seasons
```

Out[36]:
```
1       2.0
2       1.0
3       1.0
4       2.0
5       1.0
       ...
8795    2.0
8796    2.0
8797    3.0
8800    1.0
8803    2.0
Name: duration_in_seasons, Length: 2666, dtype: float64
```

The first movie added on Netflix and most recent movie added on Netflix.

In [37]:
```
first_movie = pd.Series((data["date_added"].min().strftime("%B %Y")))
first_movie
```

Out[37]:
```
0    January 2008
dtype: object
```

In [38]:
```
recent_movie = pd.Series((data["date_added"].max().strftime("%B %Y")))
recent_movie
```

Out[38]:
```
0    September 2021
dtype: object
```

In which year the oldest and the most recent movie/TV show relased on the Netflix.

In [39]:
```
oldest = data["release_year"].min()
oldest
```

Out[39]:
```
1925
```

In [40]:
```
recent = data["release_year"].max()
recent
```

Out[40]:
```
2021
```

Different types of ratings available on Netflix and the number of content released in each type.

In [41]:
```
data.groupby(["type", "rating"])["show_id"].count()
```

Out[41]:
```
type     rating
Movie    G                 41
         NC-17              3
         NR                75
         Not Available      5
         PG               287
         PG-13            490
         R                797
         TV-14           1427
         TV-G             126
         TV-MA           2062
         TV-PG            540
         TV-Y             131
         TV-Y7            139
         TV-Y7-FV           5
         UR                 3
TV Show  NR                 4
         Not Available      2
         R                  2
         TV-14            730
         TV-G              94
         TV-MA           1143
         TV-PG            321
         TV-Y             175
         TV-Y7            194
         TV-Y7-FV           1
Name: show_id, dtype: int64
```

Country Column

In [42]:
```
data["country"].value_counts()
```

Out[42]:
```
United States                                2812
India                                         972
United Kingdom                                418
Japan                                         244
South Korea                                   199
                                             ...
Romania, Bulgaria, Hungary                      1
Uruguay, Guatemala                              1
France, Senegal, Belgium                        1
Mexico, United States, Spain, Colombia          1
United Arab Emirates, Jordan                    1
Name: country, Length: 748, dtype: int64
```

It seems that many movies are produced in more than 1 country. Hence, the country column has comma separated values of countries.It's difficult to analyse how many movies were produced in each country. We can split the country column into different rows.

In [43]:
```
# drop the null values -

ctry = data[["show_id", "type", "country"]]
ctry.dropna(inplace = True)
ctry
```

```
C:\Users\Lenovo\AppData\Local\Temp\ipykernel_15536\4128015838.py:4: SettingWithCopyWa
rning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/us
er_guide/indexing.html#returning-a-view-versus-a-copy
  ctry.dropna(inplace = True)
```

Out[43]:

	show_id	type	country
0	s1	Movie	United States
1	s2	TV Show	South Africa
4	s5	TV Show	India
7	s8	Movie	United States, Ghana, Burkina Faso, United Kin...
8	s9	TV Show	United Kingdom
...	...	...	...
8801	s8802	Movie	United Arab Emirates, Jordan
8802	s8803	Movie	United States
8804	s8805	Movie	United States
8805	s8806	Movie	United States
8806	s8807	Movie	India

7967 rows × 3 columns

In [44]:

```
# split the countries by comma -

ctry["country"] = ctry["country"].apply(lambda x : x.split(","))
ctry = ctry.explode("country")
ctry
```

```
C:\Users\Lenovo\AppData\Local\Temp\ipykernel_15536\398481476.py:3: SettingWithCopyWar
ning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/us
er_guide/indexing.html#returning-a-view-versus-a-copy
  ctry["country"] = ctry["country"].apply(lambda x : x.split(","))
```

Out[44]:

	show_id	type	country
0	s1	Movie	United States
1	s2	TV Show	South Africa
4	s5	TV Show	India
7	s8	Movie	United States
7	s8	Movie	Ghana
...	...	...	...
8801	s8802	Movie	Jordan
8802	s8803	Movie	United States
8804	s8805	Movie	United States
8805	s8806	Movie	United States
8806	s8807	Movie	India

10010 rows × 3 columns

In [45]:
```
 # Remove the empty strings values

ctry["conuntry"] = ctry["country"].str.strip()
```

In [46]:
```
ctry.loc[ctry["country"] == ""]
```

Out[46]:

	show_id	type	country	conuntry
193	s194	TV Show		
365	s366	Movie		
1192	s1193	Movie		
2224	s2225	Movie		
4653	s4654	Movie		
5925	s5926	Movie		
7007	s7008	Movie		

In [47]:
```
ctry = ctry.loc[ctry["country"] != ""]
ctry["country"].nunique()
```

Out[47]:
```
196
```

There are movies from 196 conutries.

Total movies and tv shows in each country-

In [48]:
```
total = ctry.groupby(["country", "type"])["show_id"].count().reset_index()
total.pivot(index = ["country"], columns = "type", values = "show_id").sort_values("Mo
```

Out[48]:

type	Movie	TV Show
country		
United States	2364.0	841.0
India	927.0	81.0
United States	388.0	91.0
United Kingdom	382.0	245.0
Canada	187.0	84.0
...	...	...
Jordan	NaN	2.0
Luxembourg	NaN	1.0
Puerto Rico	NaN	1.0
Senegal	NaN	1.0
Ukraine	NaN	2.0

196 rows × 2 columns

Director Column

In [49]:
```
data["director"].value_counts()
```

Out[49]:
```
Rajiv Chilaka                     19
Raúl Campos, Jan Suter            18
Marcus Raboy                      16
Suhas Kadav                       16
Jay Karas                         14
                                  ..
Raymie Muzquiz, Stu Livingston     1
Joe Menendez                       1
Eric Bross                         1
Will Eisenberg                     1
Mozez Singh                        1
Name: director, Length: 4528, dtype: int64
```

In [50]:
```
drt = data[["show_id", "type", "director"]]
drt.dropna(inplace = True)
drt
```

```
C:\Users\Lenovo\AppData\Local\Temp\ipykernel_15536\1623258490.py:2: SettingWithCopyWa
rning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/us
er_guide/indexing.html#returning-a-view-versus-a-copy
  drt.dropna(inplace = True)
```

Out[50]:

	show_id	type	director
0	s1	Movie	Kirsten Johnson
2	s3	TV Show	Julien Leclercq
5	s6	TV Show	Mike Flanagan
6	s7	Movie	Robert Cullen, José Luis Ucha
7	s8	Movie	Haile Gerima
...	...	...	...
8801	s8802	Movie	Majid Al Ansari
8802	s8803	Movie	David Fincher
8804	s8805	Movie	Ruben Fleischer
8805	s8806	Movie	Peter Hewitt
8806	s8807	Movie	Mozez Singh

6173 rows × 3 columns

In [51]:
```
drt["director"].value_counts()
```

Out[51]:
```
Rajiv Chilaka                     19
Raúl Campos, Jan Suter            18
Marcus Raboy                      16
Suhas Kadav                       16
Jay Karas                         14
                                  ..
Raymie Muzquiz, Stu Livingston     1
Joe Menendez                       1
Eric Bross                         1
Will Eisenberg                     1
Mozez Singh                        1
Name: director, Length: 4528, dtype: int64
```

In [52]:
```
drt["director"].nunique()
```

Out[52]:
```
4528
```

Total 4528 directors in the dataset.

Total movies and tv shows directed by each director-

In [53]:
```
total = drt.groupby(["director", "type"])["show_id"].count().reset_index()
total.pivot(index = ["director"], columns = "type", values = "show_id").sort_values("
```

Out[53]:

type	Movie	TV Show
director		
Rajiv Chilaka	19.0	NaN
Raúl Campos, Jan Suter	18.0	NaN
Suhas Kadav	16.0	NaN
Marcus Raboy	15.0	1.0
Jay Karas	14.0	NaN
...	...	...
Vijay Roche	NaN	1.0
Vijay S. Bhanushali	NaN	1.0
Vikramaditya Motwane, Anurag Kashyap	NaN	1.0
Wouter Bouvijn	NaN	1.0
Yasuhiro Irie	NaN	1.0

4528 rows × 2 columns

We can get details about genres from 'listed_in' column.

In [54]:
```
genre = data[["show_id", "type", "listed_in"]]
genre["listed_in"] = genre["listed_in"].apply(lambda x : x.split(","))
genre = genre.explode("listed_in")
genre
```

```
C:\Users\Lenovo\AppData\Local\Temp\ipykernel_15536\3896234191.py:2: SettingWithCopyWa
rning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/us
er_guide/indexing.html#returning-a-view-versus-a-copy
  genre["listed_in"] = genre["listed_in"].apply(lambda x : x.split(","))
```

Out[54]:

	show_id	type	listed_in
0	s1	Movie	Documentaries
1	s2	TV Show	International TV Shows
1	s2	TV Show	TV Dramas
1	s2	TV Show	TV Mysteries
2	s3	TV Show	Crime TV Shows
...	...	...	...
8805	s8806	Movie	Children & Family Movies
8805	s8806	Movie	Comedies
8806	s8807	Movie	Dramas
8806	s8807	Movie	International Movies
8806	s8807	Movie	Music & Musicals

19303 rows × 3 columns

In [55]:
```
genre["listed_in"].unique()
```

Out[55]:
```
array(['Documentaries', 'International TV Shows', ' TV Dramas',
       ' TV Mysteries', 'Crime TV Shows', ' International TV Shows',
       ' TV Action & Adventure', 'Docuseries', ' Reality TV',
       ' Romantic TV Shows', ' TV Comedies', 'TV Dramas', ' TV Horror',
       'Children & Family Movies', 'Dramas', ' Independent Movies',
       ' International Movies', 'British TV Shows', 'Comedies', ' Dramas',
       ' Docuseries', ' Comedies', ' Crime TV Shows', 'TV Comedies',
       ' Spanish-Language TV Shows', 'Thrillers', ' Romantic Movies',
       ' Music & Musicals', 'Horror Movies', ' Sci-Fi & Fantasy',
       ' TV Thrillers', "Kids' TV", ' Thrillers', 'Action & Adventure',
       ' TV Sci-Fi & Fantasy', ' Classic Movies', ' Horror Movies',
       ' Anime Features', 'Reality TV', ' Sports Movies', 'Anime Series',
       " Kids' TV", 'International Movies', ' Korean TV Shows',
       'Sci-Fi & Fantasy', ' Science & Nature TV', ' Teen TV Shows',
       ' Cult Movies', 'Classic Movies', 'TV Shows',
       ' Children & Family Movies', ' Faith & Spirituality',
       ' LGBTQ Movies', 'Stand-Up Comedy', 'TV Action & Adventure',
       'Movies', 'Stand-Up Comedy & Talk Shows', 'Classic & Cult TV',
       ' Stand-Up Comedy & Talk Shows', 'Anime Features',
       ' Documentaries', 'Romantic TV Shows', 'Cult Movies',
       'Independent Movies', 'TV Horror', 'Spanish-Language TV Shows',
       ' Classic & Cult TV', 'Music & Musicals', 'Romantic Movies',
       'LGBTQ Movies', ' Stand-Up Comedy', 'TV Sci-Fi & Fantasy',
       'Sports Movies'], dtype=object)
```

In [56]:
```
genre["listed_in"].nunique()
```

Out[56]:
```
73
```

There are total 73 genres in the dataset.

Total movies and TV shows in each genre -

In [57]:
```
total = genre.groupby(["listed_in", "type"])["show_id"].count().reset_index()
total.pivot(index = "listed_in", columns = "type", values = "show_id").sort_index()
```

Out[57]:

type	Movie	TV Show
listed_in		
Anime Features	50.0	NaN
Children & Family Movies	36.0	NaN
Classic & Cult TV	NaN	6.0
Classic Movies	36.0	NaN
Comedies	464.0	NaN
...	...	...
TV Dramas	NaN	67.0
TV Horror	NaN	11.0
TV Sci-Fi & Fantasy	NaN	1.0
TV Shows	NaN	16.0
Thrillers	65.0	NaN

73 rows × 2 columns

Cast Column

In [58]:
```
cast = data[["show_id", "type", "cast"]]
cast.dropna(inplace = True)
cast
```

```
C:\Users\Lenovo\AppData\Local\Temp\ipykernel_15536\2205502739.py:2: SettingWithCopyWa
rning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/us
er_guide/indexing.html#returning-a-view-versus-a-copy
  cast.dropna(inplace = True)
```

Out[58]:

	show_id	type	cast
1	s2	TV Show	Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban...
2	s3	TV Show	Sami Bouajila, Tracy Gotoas, Samuel Jouy, Nabi...
4	s5	TV Show	Mayur More, Jitendra Kumar, Ranjan Raj, Alam K...
5	s6	TV Show	Kate Siegel, Zach Gilford, Hamish Linklater, H...
6	s7	Movie	Vanessa Hudgens, Kimiko Glenn, James Marsden, ...
...	...	...	...
8801	s8802	Movie	Ali Suliman, Saleh Bakri, Yasa, Ali Al-Jabri, ...
8802	s8803	Movie	Mark Ruffalo, Jake Gyllenhaal, Robert Downey J...
8804	s8805	Movie	Jesse Eisenberg, Woody Harrelson, Emma Stone, ...
8805	s8806	Movie	Tim Allen, Courteney Cox, Chevy Chase, Kate Ma...
8806	s8807	Movie	Vicky Kaushal, Sarah-Jane Dias, Raaghav Chanan...

7972 rows × 3 columns

In [59]:
```
cast["cast"] = cast["cast"].apply(lambda x : x.split(","))
cast = cast.explode("cast")
cast
```

```
C:\Users\Lenovo\AppData\Local\Temp\ipykernel_15536\2009803672.py:1: SettingWithCopyWa
rning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/us
er_guide/indexing.html#returning-a-view-versus-a-copy
  cast["cast"] = cast["cast"].apply(lambda x : x.split(","))
```

Out[59]:

	show_id	type	cast
1	s2	TV Show	Ama Qamata
1	s2	TV Show	Khosi Ngema
1	s2	TV Show	Gail Mabalane
1	s2	TV Show	Thabang Molaba
1	s2	TV Show	Dillon Windvogel
...	...	...	...
8806	s8807	Movie	Manish Chaudhary
8806	s8807	Movie	Meghna Malik
8806	s8807	Movie	Malkeet Rauni
8806	s8807	Movie	Anita Shabdish
8806	s8807	Movie	Chittaranjan Tripathy

64057 rows × 3 columns

In [60]:
```
cast["cast"].nunique()
```

Out[60]:
```
39260
```

There are total 39260 actors.

Total movies and TV shows by each actor -

In [61]:
```
total = cast.groupby(["cast","type"])["show_id"].count().reset_index()
total.pivot(index = "cast", columns = "type", values = "show_id").sort_values("Movie",
```

Out[61]:

type	Movie	TV Show
cast		
Anupam Kher	38.0	1.0
Om Puri	27.0	NaN
Rupa Bhimani	27.0	4.0
Shah Rukh Khan	26.0	NaN
Paresh Rawal	25.0	NaN
...	...	...
Zoe Tay	NaN	2.0
Zooey Deschanel	NaN	1.0
Öykü Karayel	NaN	1.0
İbrahim Çelikkol	NaN	1.0
Şükrü Özyıldız	NaN	1.0

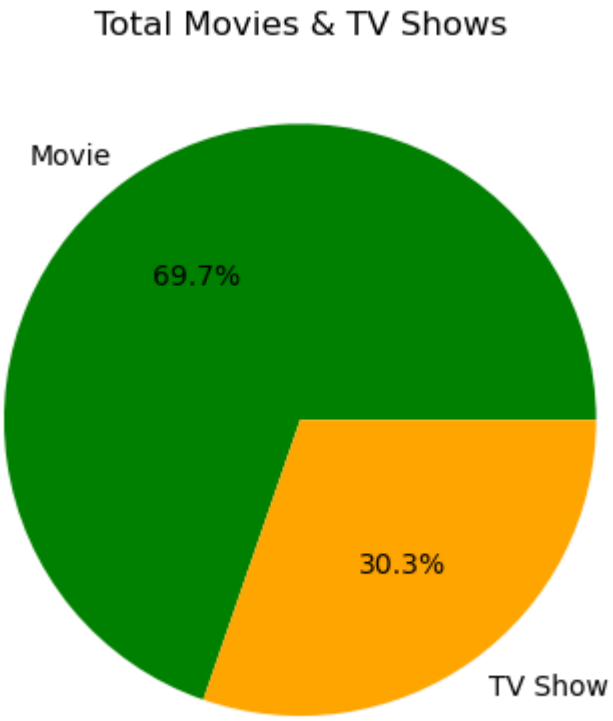
39260 rows × 2 columns

In [ ]:

4. Visual Analysis - Univariate & Bivariate

1. Distribution of content across differner types

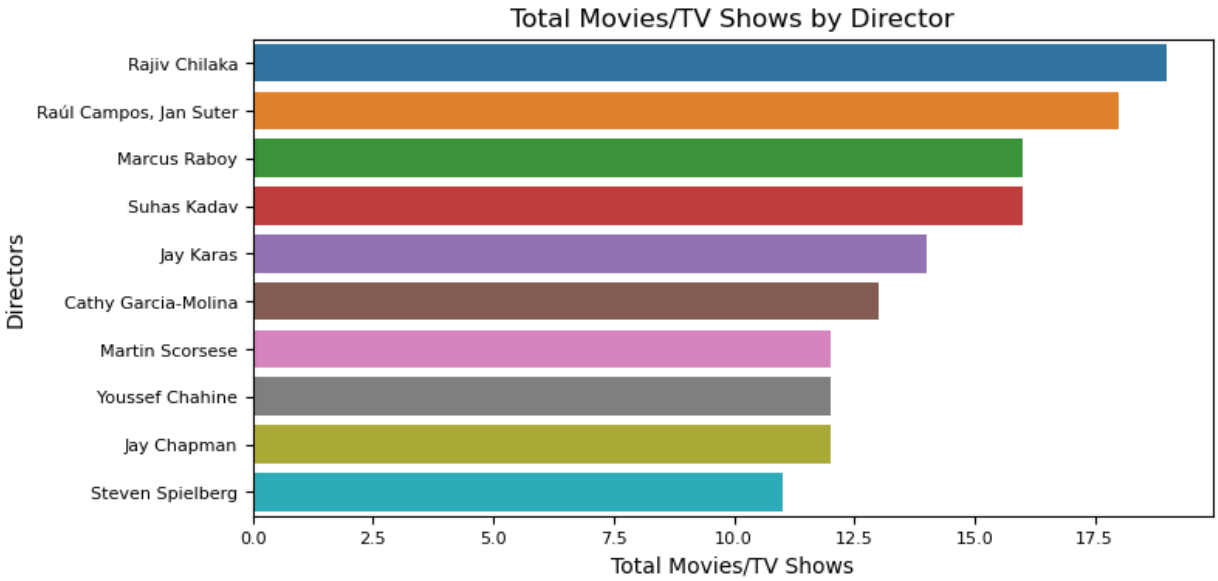
In [62]:
```
types = data.type.value_counts()
plt.pie(types, labels = types.index, autopct = "%1.1f%%", colors = ["green", "orange"]
plt.title("Total Movies & TV Shows")
plt.show()
```



It seems that in pie chart around 70% content is Movies and around 30% content is TV shows.

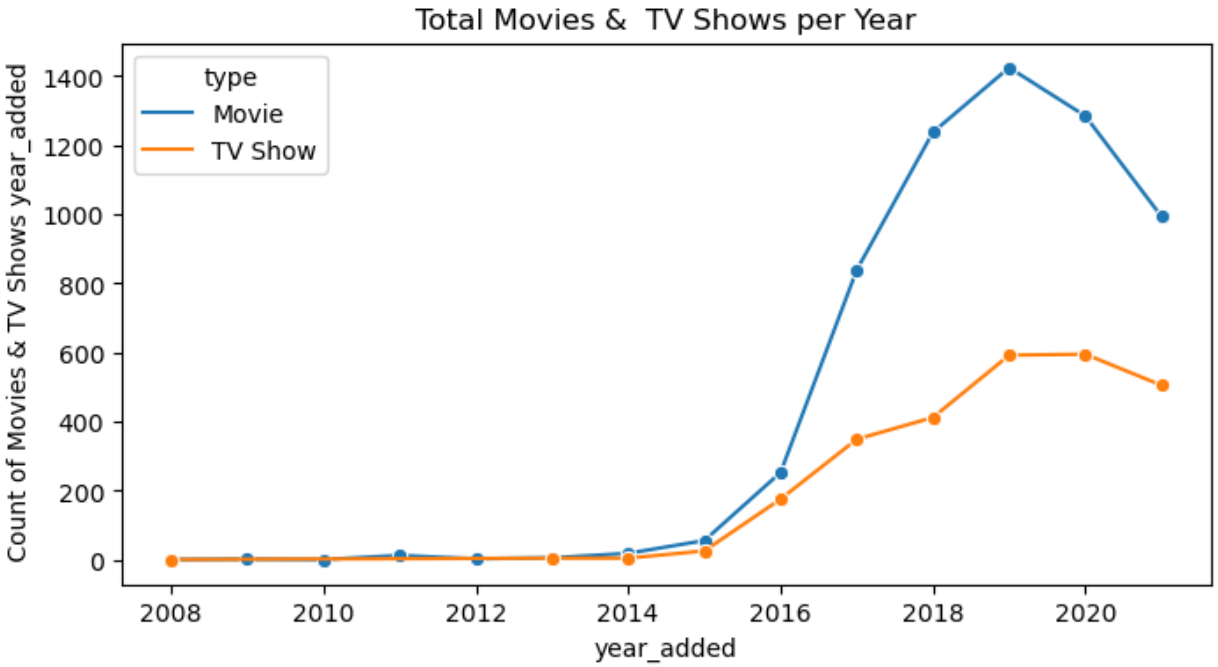
2. Total Movies/TV Shows by each Director.

In [63]:
```
top = drt["director"].value_counts().head(10).index
data_new = drt.loc[drt["director"].isin(top)]

plt.figure(figsize = (8, 4))

sns.countplot(data = data_new, y ="director", order = top, orient = "v")

plt.xlabel("Total Movies/TV Shows", fontsize = 10)
plt.ylabel("Directors", fontsize = 10)

plt.xticks(fontsize = 8)
plt.yticks( fontsize = 8)

plt.title("Total Movies/TV Shows by Director", fontsize = 12)
plt.show()
```



3. The number of Movies/TV shows added on Netflix per Year.

In [64]:
```
total = data.groupby(["year_added", "type"])["show_id"].count().reset_index()

total.rename({"show_id" : "Count of Movies/TV Shows"}, axis = 1, inplace = True)

plt.figure(figsize = (8, 4))

sns.lineplot(data = total, x = "year_added", y = "Count of Movies/TV Shows", hue = "ty

plt.xlabel("year_added", fontsize = 10)
plt.ylabel(" Count of Movies & TV Shows year_added", fontsize = 10)

plt.title("Total Movies &  TV Shows per Year", fontsize = 12)
plt.show()
```



Conclusion -

1. After 2015 content added on Netflix surged drastically.
2. In the 2020 - 2021 seen that there is drop in the content added.
3. Highest Movies and TV shows added on Netlix in 2019.
4. As compare to Movies, TV shows not dropped drastically.

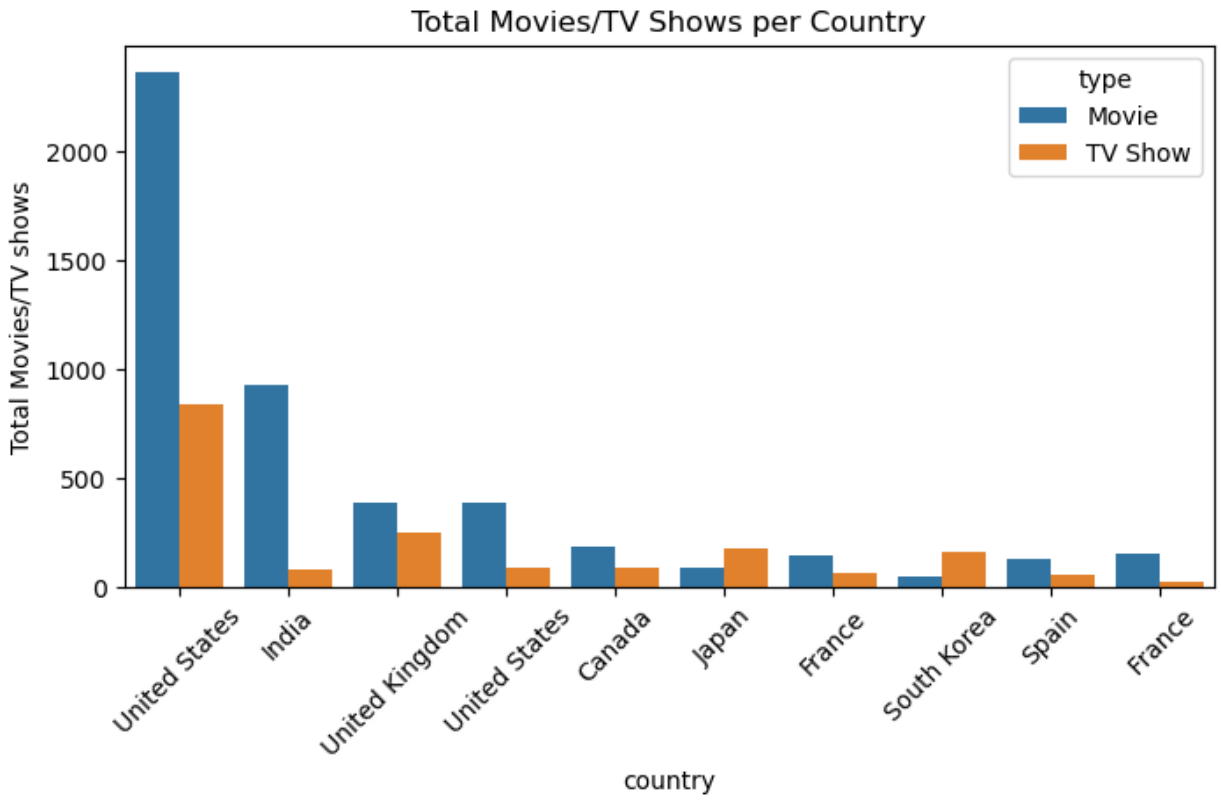
4.Total Movies/TV Shows per Country

In [65]:
```
top = ctry.country.value_counts().head(10).index

data_new = ctry.loc[ctry["country"].isin(top)]

x = data_new.groupby(["country", "type"])["show_id"].count().reset_index()
x.pivot( index = "country", columns = "type", values = "show_id").sort_values("Movie",
```

Out[65]:

type	Movie	TV Show
country		
United States	2364	841
India	927	81
United States	388	91
United Kingdom	382	245
Canada	187	84
France	155	26
France	148	64
Spain	129	52
Japan	85	173
South Korea	47	164

In [66]:
```
plt.figure(figsize = (8,4))

sns.countplot(data = data_new, x = "country", order = top, hue = "type")

plt.xticks(rotation = 45)
plt.ylabel("Total Movies/TV shows")
plt.title("Total Movies/TV Shows per Country")

plt.show()
```



5.Total Movies/TV Shows in each Genre.

In [67]:
```
top_movies = genre[genre["type"] == "Movie"].listed_in.value_counts().head(10).index
data_movie = genre.loc[genre["listed_in"].isin(top_movies)]
data_movie
```

Out[67]:

	show_id	type	listed_in
0	s1	Movie	Documentaries
6	s7	Movie	Children & Family Movies
7	s8	Movie	Dramas
7	s8	Movie	Independent Movies
7	s8	Movie	International Movies
...	...	...	...
8802	s8803	Movie	Thrillers
8804	s8805	Movie	Comedies
8805	s8806	Movie	Children & Family Movies
8806	s8807	Movie	Dramas
8806	s8807	Movie	International Movies

10415 rows × 3 columns

In [68]:
```
top_tv_shows = genre[genre["type"] == "TV Show"].listed_in.value_counts().head(10).inc
data_tv = genre.loc[genre["listed_in"].isin(top_tv_shows)]
```

```
data_tv
```

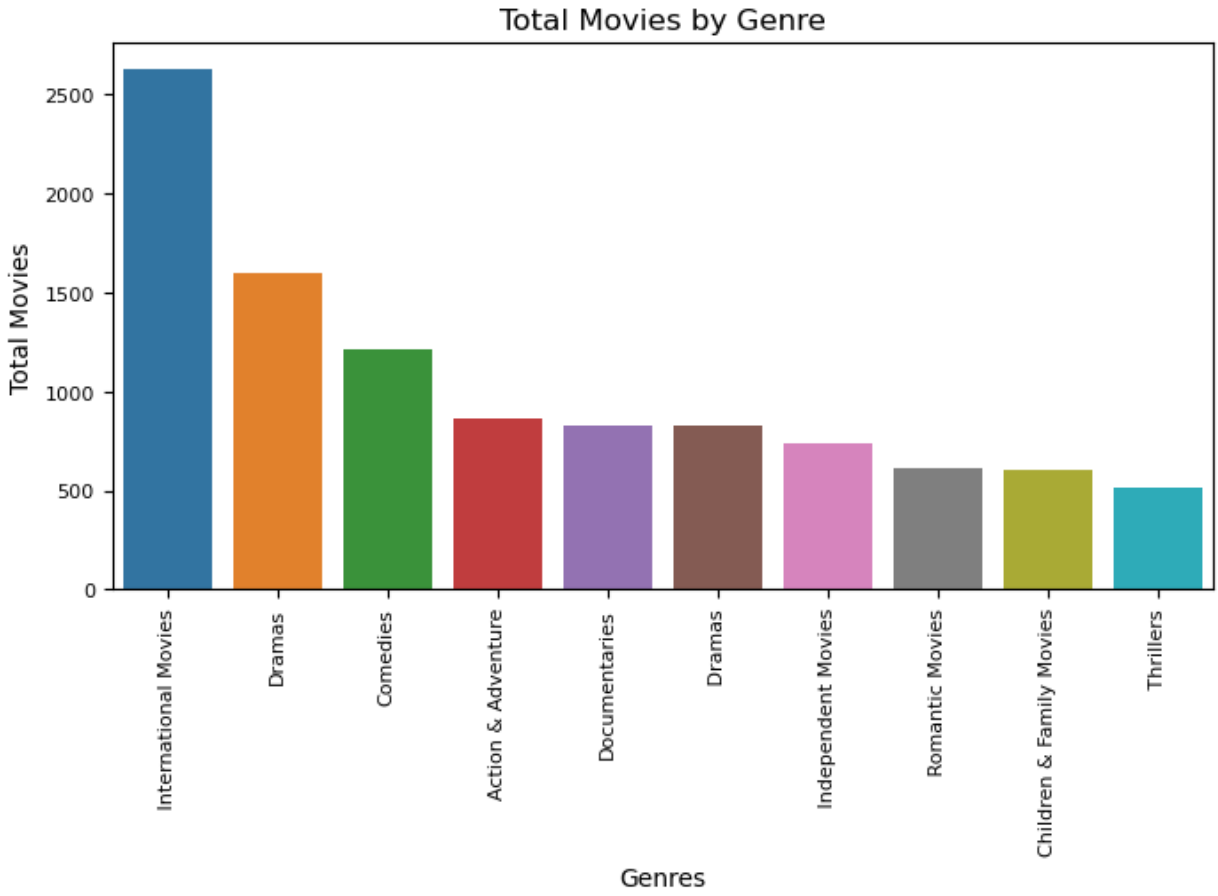
Out[68]:

	show_id	type	listed_in
1	s2	TV Show	International TV Shows
1	s2	TV Show	TV Dramas
2	s3	TV Show	Crime TV Shows
2	s3	TV Show	International TV Shows
3	s4	TV Show	Docuseries
...	...	...	...
8800	s8801	TV Show	International TV Shows
8800	s8801	TV Show	Romantic TV Shows
8800	s8801	TV Show	TV Dramas
8803	s8804	TV Show	Kids' TV
8803	s8804	TV Show	TV Comedies

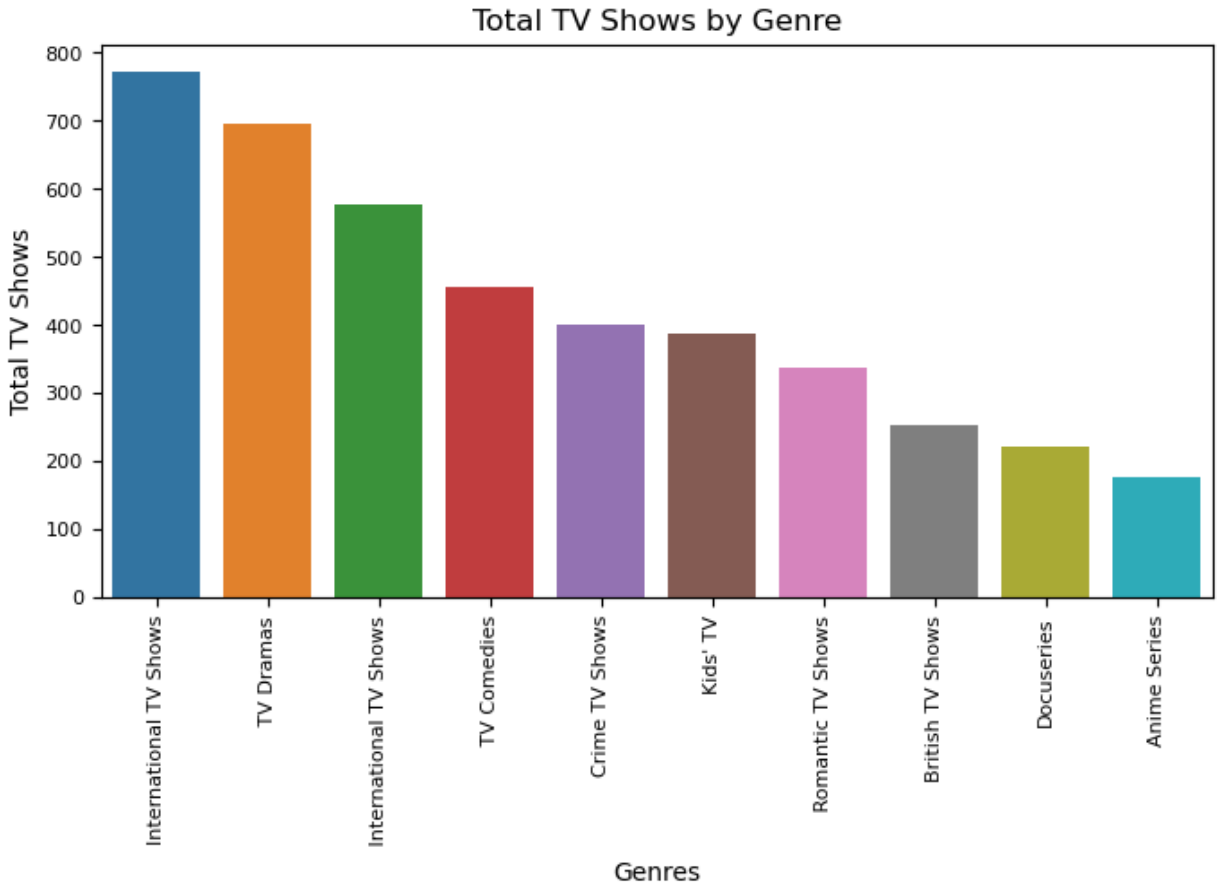
4270 rows × 3 columns

In [69]:

```
plt.figure(figsize = (8,4))
sns.countplot(data = data_movie, x = "listed_in", order = top_movies)
plt.xticks(rotation = 90, fontsize = 8)
plt.yticks(fontsize = 8)
plt.xlabel("Genres", fontsize = 10)
plt.ylabel("Total Movies", fontsize = 10)
plt.title("Total Movies by Genre")
plt.show()
```



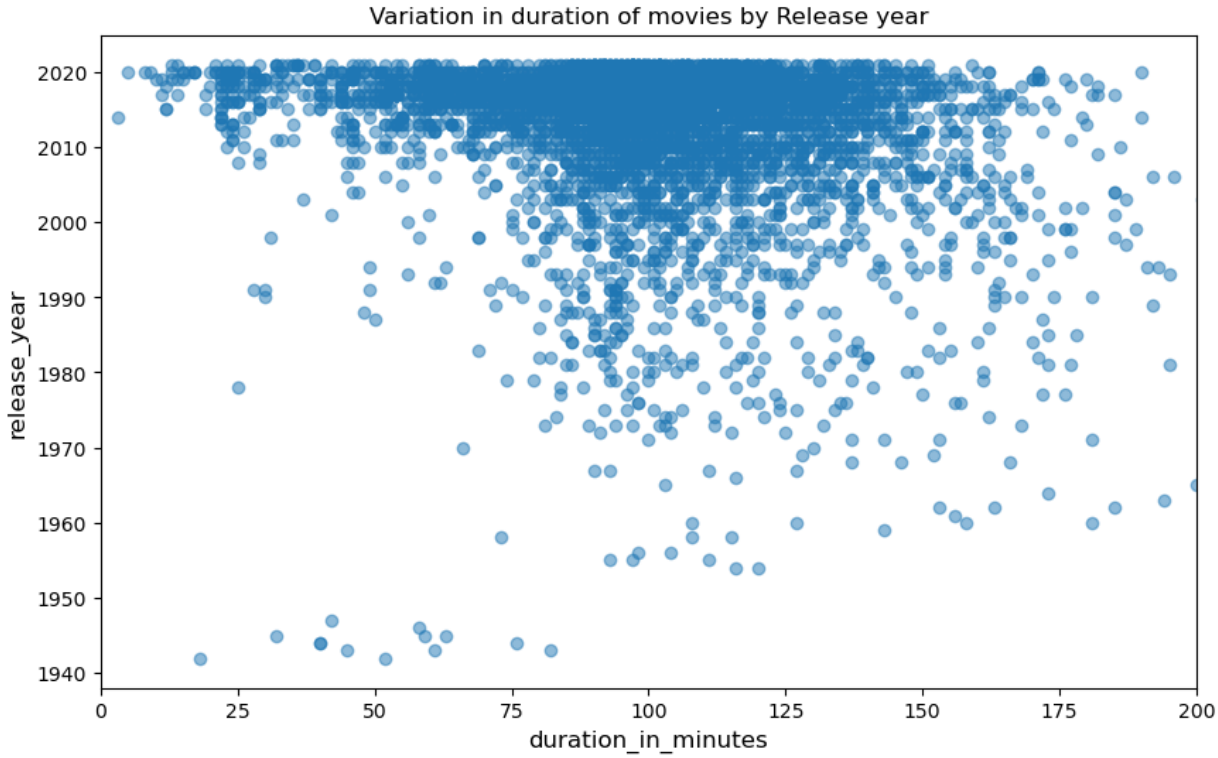
In [70]:
```
plt.figure(figsize = (8,4))
sns.countplot(data = data_tv, x = "listed_in", order = top_tv_shows)
plt.xticks(rotation = 90, fontsize = 8)
plt.yticks(fontsize = 8)
plt.xlabel("Genres", fontsize = 10)
plt.ylabel("Total TV Shows", fontsize = 10)
plt.title("Total TV Shows by Genre")
plt.show()
```



5.Bivariate Analysis

1.Variation in duration of movies by Release year

In [71]:
```
plt.figure(figsize = (10,6))
plt.scatter(movies["duration_in_minutes"], movies["release_year"], alpha = 0.5)

plt.xlabel("duration_in_minutes", fontsize = 12)
plt.ylabel("release_year",fontsize = 12)

plt.title("Variation in duration of movies by Release year")

plt.xlim(0,200)
plt.show()
```



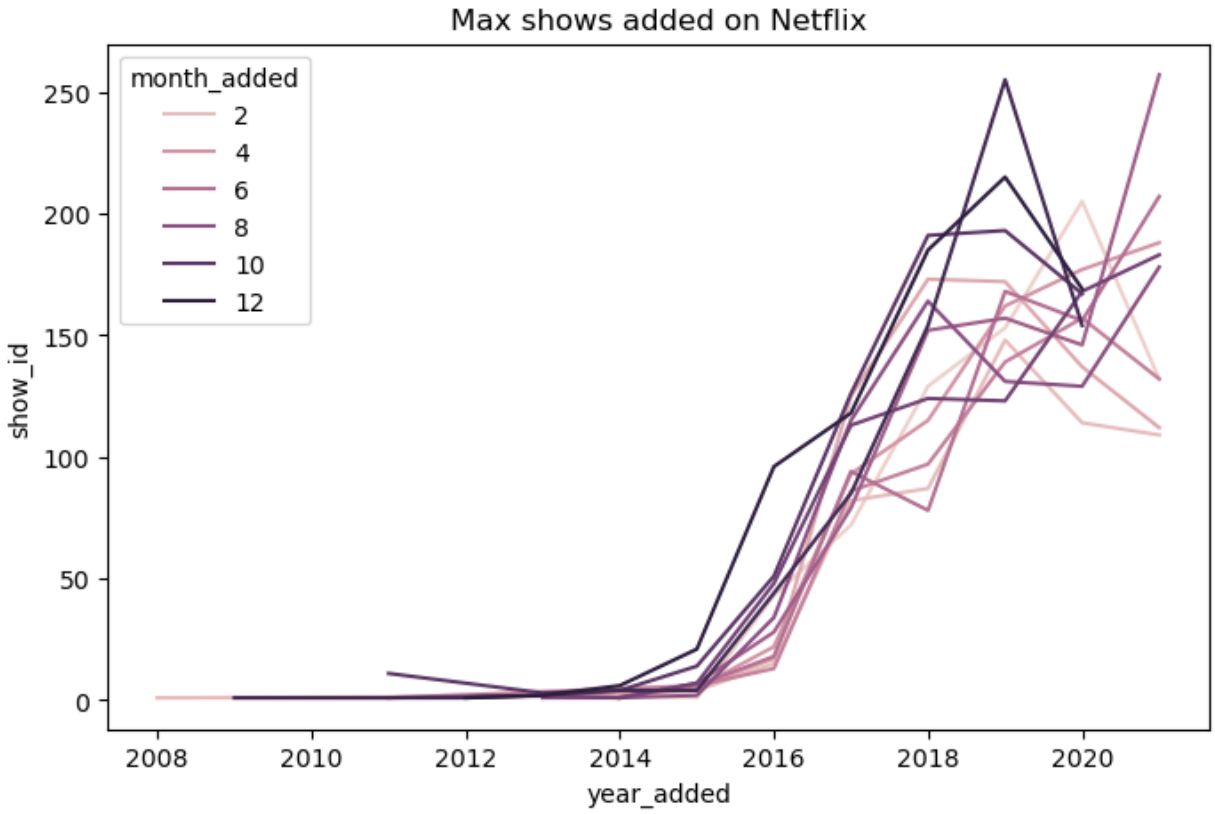
Conclusion -

1. Movies shorter than 150 minutes duration have increased drastically after 2000 & that are not much popular.
2. Short movies have been popular in last 10 years.

2. Time when maximum content added on the Netflix.

In [72]:
```
month_year = data.groupby(["year_added", "month_added"])["show_id"].count().reset_inde
```

In [73]:
```
plt.figure(figsize = (8, 5))

sns.lineplot(data = month_year, x = "year_added", y = "show_id", hue = "month_added")

plt.title("Max shows added on Netflix")
plt.show()
```



Conclusion -

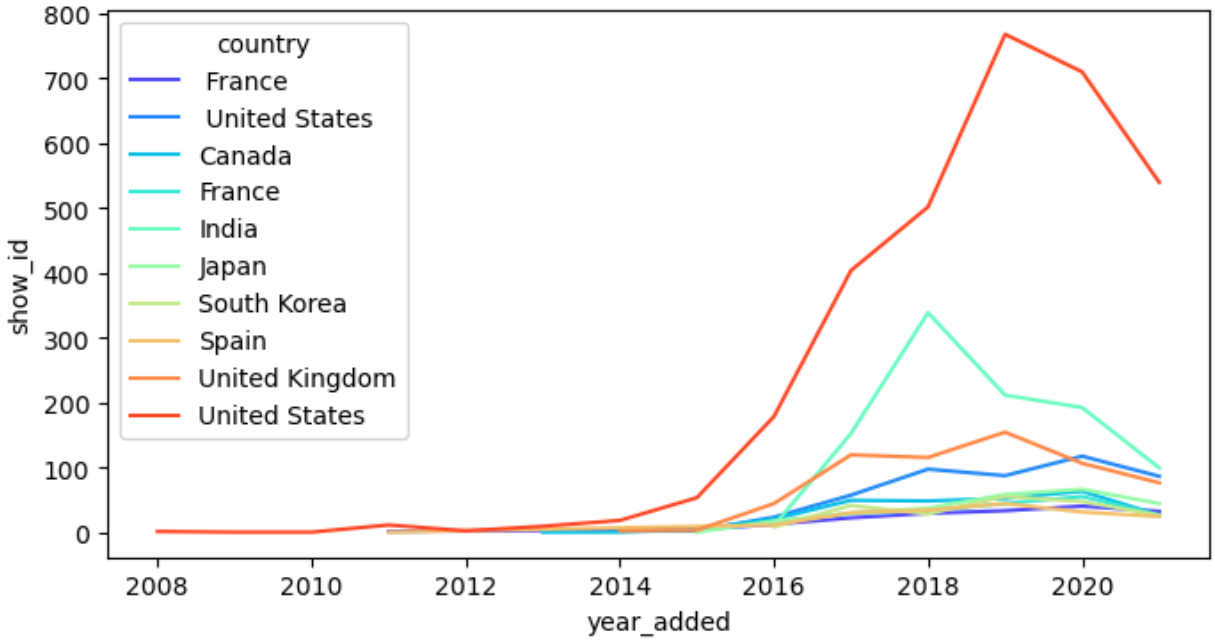
1. Shows getting added on Netflix is increasing with each year until 2020.
2. Oct-Dec have more shows being added than the other months of the year.

3. The countries which has added more number of content over the time.

In [74]:
```
country_list = ctry.country.value_counts().head(10).index
```

In [75]:
```
top_10_countries = ctry.loc[ctry["country"].isin(country_list)]
country_year = top_10_countries.merge(data, on = "show_id")[["show_id", "country_x", '
country_year.columns = ["show_id", "country", "type", "year_added"]
country_year = country_year.groupby(["country", "year_added"])["show_id"].count().rese
```

In [76]:
```
plt.figure(figsize =(8,4))

sns.lineplot(data = country_year, x = "year_added", y = "show_id", hue = "country", pa


plt.show()
```



Conclusion -

1. United Stated have added highset number of movies/TV shows over the time.
2. Since 2016, India has seen spike in popularity of content and added more number of content, followed by United Kingdom at 3rd position.

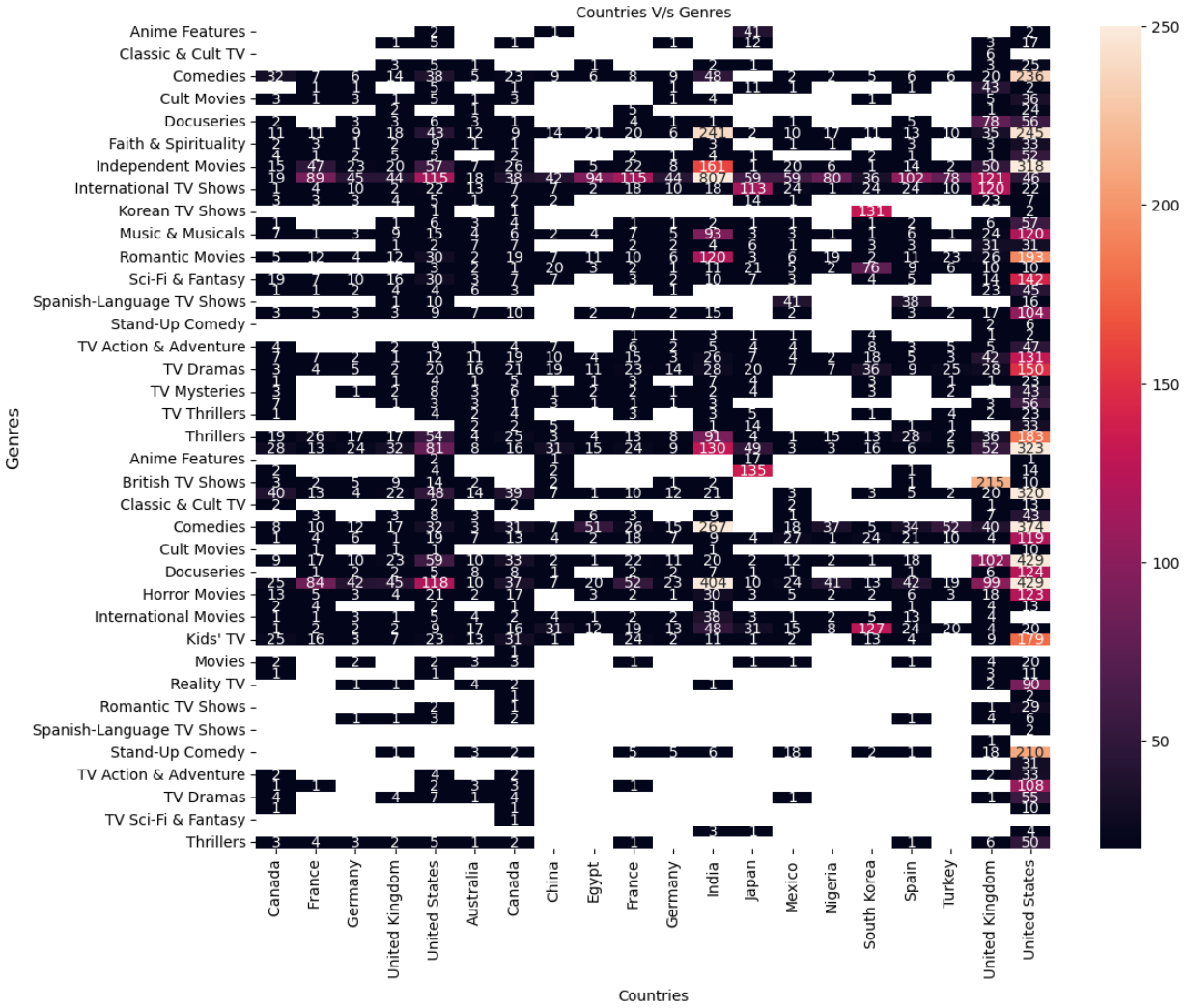
4.Popular genres in top 20 countries

In [84]:
```
top_20_country = ctry.country.value_counts().head(20).index
top_20_country = ctry.loc[ctry["country"].isin(top_20_country)]
```

In [82]:
```
x = top_20_country.merge(genre, on = "show_id").drop_duplicates()
country_genre = x.groupby(["country", "listed_in"])["show_id"].count().sort_values(asc
country_genre = country_genre.pivot(index = "listed_in", columns = "country", values =
```

In [86]:
```
plt.figure(figsize = (12,10))
sns.heatmap(data = country_genre, annot = True, fmt = ".0f", vmin = 20, vmax = 250)
plt.xlabel('Countries' , fontsize = 10)
plt.ylabel('Genres' , fontsize = 12)
plt.title('Countries V/s Genres' , fontsize = 10)
```

Out[86]:
```
Text(0.5, 1.0, 'Countries V/s Genres')
```



6.Insights based on Non-Graphical and Visual Analysis

1. On Netflix around 70 % content is of Movies & and 30 % is of TV Shows.
2. Content on Netflix from 122 countries are present, in which United States is the highest contributor with almost 37 % of all content.
3. International Movies and TV Shows , Dramas , and Comedies are the top 3 genres on Netflix for both Movies and TV shows.
4. Only United States have a good mix of almost all genres.
5. Indian Actors acted in maximum movies on netflix. Top 5 actors are in India based on quantity of movies.
6. Shorter duration movies have been popular in last 10 years.
7. Content uploading on the Netflix started form the year 2008, and it has very less content till 2014.
8. Drastic surge in the content uploaded on Netflix marks in 2015.
9. Year 2020 and 2021 has seen the drop in content added on Netflix, possibly because of Pandemic.

10. From 2018 drop in the movies content is seen, but rise in TV shows is observed. It shows the rise in popularity of TV shows in the recent years.
11. On Netflix around 4528 directors have their movies or tv shows on Netflix.
12. In the range 2005-2021 max shows.
13. 1-3 seasons is the range for TV shows seasons, excluding potential outliers. 1

7. Business Insights

1. Netflix is currently serving mostly Mature audiences or Children with parental guidance. It have scope to cater other audiences as well such as familymen , Senior citizen , kids of various age etc.

2. The country like India , which is highly populous , has maximum content available only in three rating TV-MA, TV-14 , TV-PG. It is unlikely to serve below 14 age and above 35 year age group .

3. Netflix ha need to add demographic content of any country. Netflix can produce higher number of content in the perticular rating as per demographic of the country.

4. Like in Indian Mythological content is highly popular. We can create such more country specific genres and It might also be liked acorss the world just like Japanese Anime.

5. Japan have only 3 rating of content largely served - TV-MA, TV-14 , TV-PG.Japan have high population of age above 60, and this can be served by increasing the content suitable for this age group.

6. Very limited genres are focussed in most of the countries except US. It seems the current available genres suits best for US and few countries but maximum countries need some more genres which are highly popular in the region.